

ANNUAL REPORT

1962

UNION WATER SYSTEM

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UNION WATER TREATMENT PLANT

OPERATED FOR

TOWNSHIP OF GOSFIELD SOUTH

TOWNSHIP OF GOSFIELD NORTH

TOWNSHIP OF MERSEA

TOWN OF LEAMINGTON

H. J. HEINZ COMPANY

TOWN OF ESSEX

TOWNSHIP OF MAIDSTONE

BY

THE ONTARIO WATER RESOURCES COMMISSION

Mr. A. M. Snider	-	Chairman
Dr. A. E. Berry	-	General Manager
Mr. D. S. Caverly	-	Assistant General Manager, and Director of Plant Operations
Mr. B. C. Palmer	-	Assistant Director, Division of Plant Operations
Mr. A. C. Beattie	-	Project Engineer, Division of Plant Operations

Prepared by the

Division of Plant Operations

THE UNION WATER SYSTEM
ANNUAL REPORT FOR 1962

GENERAL

The Union Water System consists of a 1,400 foot intake pipe, low lift pumping station, treatment plant, underground reservoir, feeder water mains, branch mains, two elevated tanks and a booster station. Treated water is supplied to the Towns of Essex and Leamington, the Townships of Maidstone, Gosfield South, Gosfield North and Mersea, and the H. J. Heinz Company of Canada Limited. The total population of the areas listed above is 33,000. Approximately 15,200 persons in these areas receive water from the system.

The design of the project was carried out by C. G. Russell Armstrong, Consulting Engineers, Windsor, and the general contractor for the filtration plant was the Schwenger Construction Company Limited, Hamilton. The cost of the complete system was \$3,854,000 with the intake, low lift pumping station, treatment plant and reservoir costing approximately \$2,000,000.

The staff employed for the operation and maintenance of the Union Water System consists of a Superintendent, plant electrician, plant mechanic, four operators, a caretaker and a grounds keeper. Their duties include the operation of the low lift pumping station, treatment plant and booster station and the maintenance of all equipment, meters, buildings, grounds and feeder mains in the system. Over-all supervision of the project is provided by the Division of Plant Operations through its engineers and technicians. Periodic inspections, analysis of treatment records, assistance with special problems and general supervision is provided by the engineers. A yearly

inspection of all equipment in the system and assistance on mechanical or electrical problems is provided through the services of the technicians. No part of the cost for head office supervision is charged against the project.

The year 1962 is the third complete year of operation of the system.

DESIGN DATA

1. Intake

The intake pipe is a 54 inch, asbestos coated, corrugated steel pipe 1,400 feet in length located at a minimum depth of 15 feet below the surface of the lake. Solids are excluded by a bar screen and a travelling mesh screen with $\frac{1}{4}$ inch openings.

2. Low Lift Pumps

Screened lake water is pumped through a 24 inch diameter concrete pipe to the treatment plant by four vertical turbine pumps. Two of the pumps have a capacity of two million gallons per day each and the other two each have a capacity of four million gallons per day. The total capacity of the low lift pumps at a head of 100 feet is 12 million gallons per day. One of the four MGD pumps is provided with a standby diesel engine.

3. Microstrainer

Upon reaching the treatment plant, the raw water passes through a microstrainer 10 feet long by 10 feet in diameter. The microstrainer fabric is made from stainless steel strands arranged in such a fashion to give a maximum opening of

1/7000 of an inch. This size of opening is necessary to remove algae and other foreign matter from the water. The microstrainer is designed to screen water at the rate of 7.6 MGD.

The microstrainer is backwashed continuously with water and is cleaned periodically with a 12% chlorine solution. The speed of the drum and the backwash water pressure is controlled automatically by the head loss across the fabric.

4. Clarifier

A clarifier, 94 feet in diameter by 19 feet side water depth receives water from the microstrainer. The clarifier is a solids contact type and is the largest unit of its kind in Canada. It will treat up to eight million gallons per day removing suspended solids and turbidity down to about five parts per million. Chemicals are added to the clarifier for coagulation to improve settling. Sludge is withdrawn automatically from the bottom of the clarifier by time clock control.

5. Chemical Feeders

Liquid alum is applied by two proportioning pumps, each with a capacity of 30 gallons per hour, to the water entering the clarifier.

Two volumetric type dry chemical feeders are also capable of applying chemicals to the water entering the clarifiers. It is, therefore, possible to add activated carbon for taste and odour control or coagulant aids to induce better settling in the clarifier. Other dry type chemicals can also be fed to the water with this equipment.

Chlorine is injected into the water before entering the clarifier and again before it reaches the distribution system. Three "V" notch type chlorinators are utilized for this purpose with one chlorinator acting as a standby.

6. Sand Filters

The water receives its final clarification by passing through four 18' by 36' double type rapid sand filters of two million gallons per day capacity each. This represents a filtering rate of 2.15 gallons per square foot per minute. The filters are made up of a pre-cast bottom, five layers of gravel each three inches in depth and 27 inches of sand.

The filters are backwashed by a 3,500 gallon per minute pump. This provides a backwash rate of 13 gallons per square foot per minute or 21 inches of rise per minute. Palmer sweeps are used for surface cleaning.

7. Storage

Water is stored in a two million gallon underground reservoir at the treatment plant. In addition, there is a 330,000 gallon elevated tank near Leamington and 250,000 gallon elevated tank at Essex.

8. High Lift Pumps

The five high lift pumps have capacities of 1, 2.6, 4, 5 and 10 million gallons per day each. The four million gallon per day pump is equipped with both an electric motor and a diesel engine drive.

All pumps are automatically operated, and space has been provided for future units if they are required.

FLOW

During 1962 a total of 1310.1 million gallons of water were pumped from the plant. This represents an increase of 8.4 per cent over 1961 and an increase of 26.6 per cent over 1960.

During 1960 and 1961 the peak monthly flows occurred in July and August. During 1962 the month of May was the maximum month when a total of 163.5 million gallons was pumped. The next highest peak occurred in August.

Table I indicates the total flows pumped during each month and also the maximum and minimum daily flows in each month.

Table II indicates peak demands for various time intervals as a per cent of design capacity. The table also indicates the effect of adding a microstrainer and a 2 million gallon reservoir. It should be noted that in 1962 the critical peak demand was for a 4 day period when the demand reached 91 per cent of the plant capacity.

Graph I indicates that the average daily flow of treated water was 3.7 million gallons or 49 per cent of the design capacity of the plant.

It can also be seen that 10 per cent of the time the flow will exceed 5.4 million gallons or 71 per cent of the design capacity.

In the appendix, at the back of the report, are a number of graphs indicating the total monthly flows for 1960, 1961 and 1962 for the Union Water Treatment Plant and each of the participants.

Graph II indicates the consumption of the various participants as a per cent of total consumption. The first

plot shows the distribution for the 12 months of 1962. The second plot shows the distribution during the peak month of May, 1962. It can be seen that Mersea and Gosfield South are using a larger per cent of the flow during May than for the whole year. The third plot for the month of August indicates that all participants were using more water than their yearly average but that the distribution between participants was similar to the yearly distribution. The last plot shows the distribution of the 5 year guaranteed minimum consumption

Table III indicates the total yearly consumption of each of the participants and the per cent of the total yearly flow consumed by each participant.

In general, it can be seen that the smaller consumers are increasing the amount of water required each year while the two big consumers are increasing very little. As a consequence, the smaller consumers are increasing their percentage of the total yearly flow while the big consumers are reduced on a percentage basis.

TABLE I
UNION WATER TREATMENT PLANT

MONTH	TOTAL FLOW M.G.	<u>1962 FLOWS</u> MINIMUM DAILY FLOW M.G.D.	MAXIMUM DAILY FLOW M.G.D.
January	89.9	1.59	3.69
February	79.2	1.38	3.61
March	75.9	1.06	3.43
April	97.0	1.50	5.15
May	163.5	1.99	8.22
June	144.2	3.08	6.46
July	123.0	1.53	5.33
August	156.7	3.10	5.26
September	143.3	2.46	5.79
October	91.3	1.65	3.71
November	78.7	1.54	3.11
December	68.4	1.48	3.01
TOTAL:	1310.0		

TABLE II

UNION WATER SYSTEM

PEAK DEMAND AS A
PERCENTAGE OF DESIGN CAPACITY

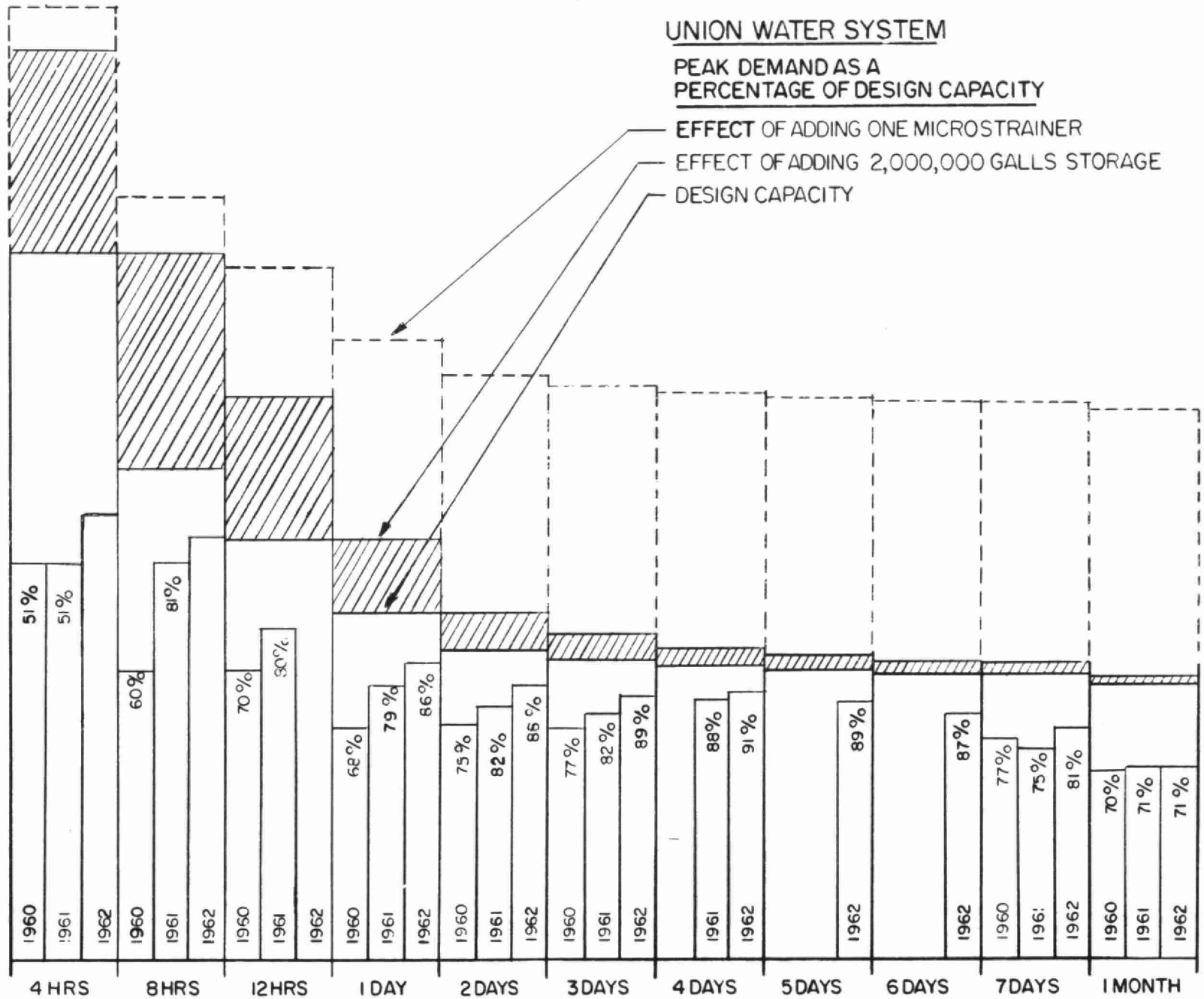
EFFECT OF ADDING ONE MICROSTRAINER

EFFECT OF ADDING 2,000,000 GALLS STORAGE

DESIGN CAPACITY

DEMAND MGD

27
26
25
24
23
22
21
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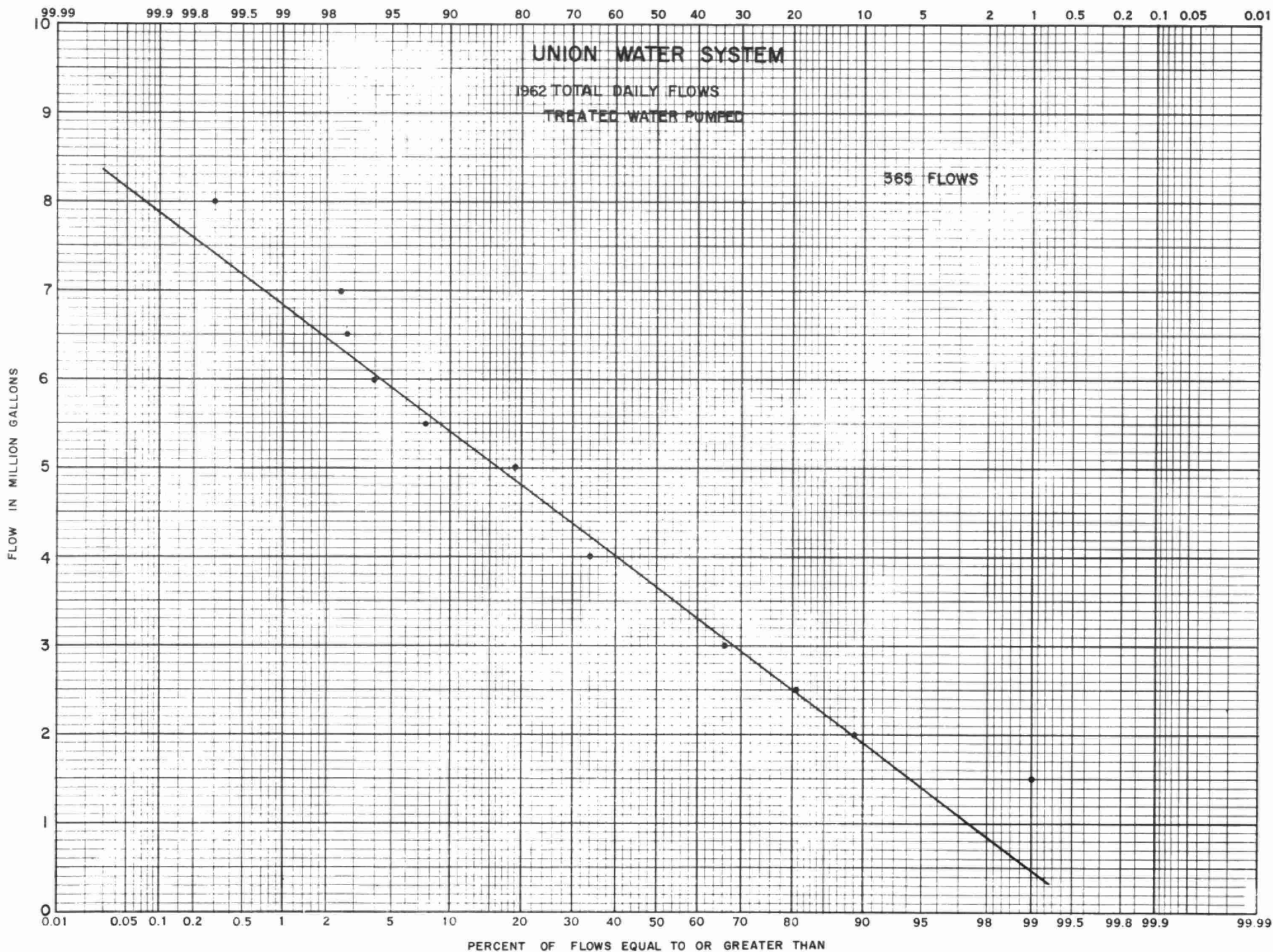


PERIOD OF DEMAND



GC8-27B

ARITHMETIC PROBABILITY
MADE IN CANADA



NO. 31-233, 10 DIVISIONS PER INCH BOTH WAYS, 70 PER 100 DIVISIONS, CODING BOOK CO., INC., NEW ROCHELLE, N.Y., PRINTED IN U.S.A.

AREA CONSUMPTION AS PERCENT OF TOTAL CONSUMPTION

12 MONTHS
1962

PEAK MONTH
MAY 1962

AUGUST 1962

5 YEARS
GUARANTEED
MINIMUMS

H. J. HIENZ
LEAMINGTON
ESSEX
MERSEA
GOSFIELD S.
GOSFIELD N.
MAIDSTONE

H. J. HIENZ
LEAMINGTON
ESSEX
MERSEA
GOSFIELD S.
GOSFIELD N.
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GOSFIELD N.
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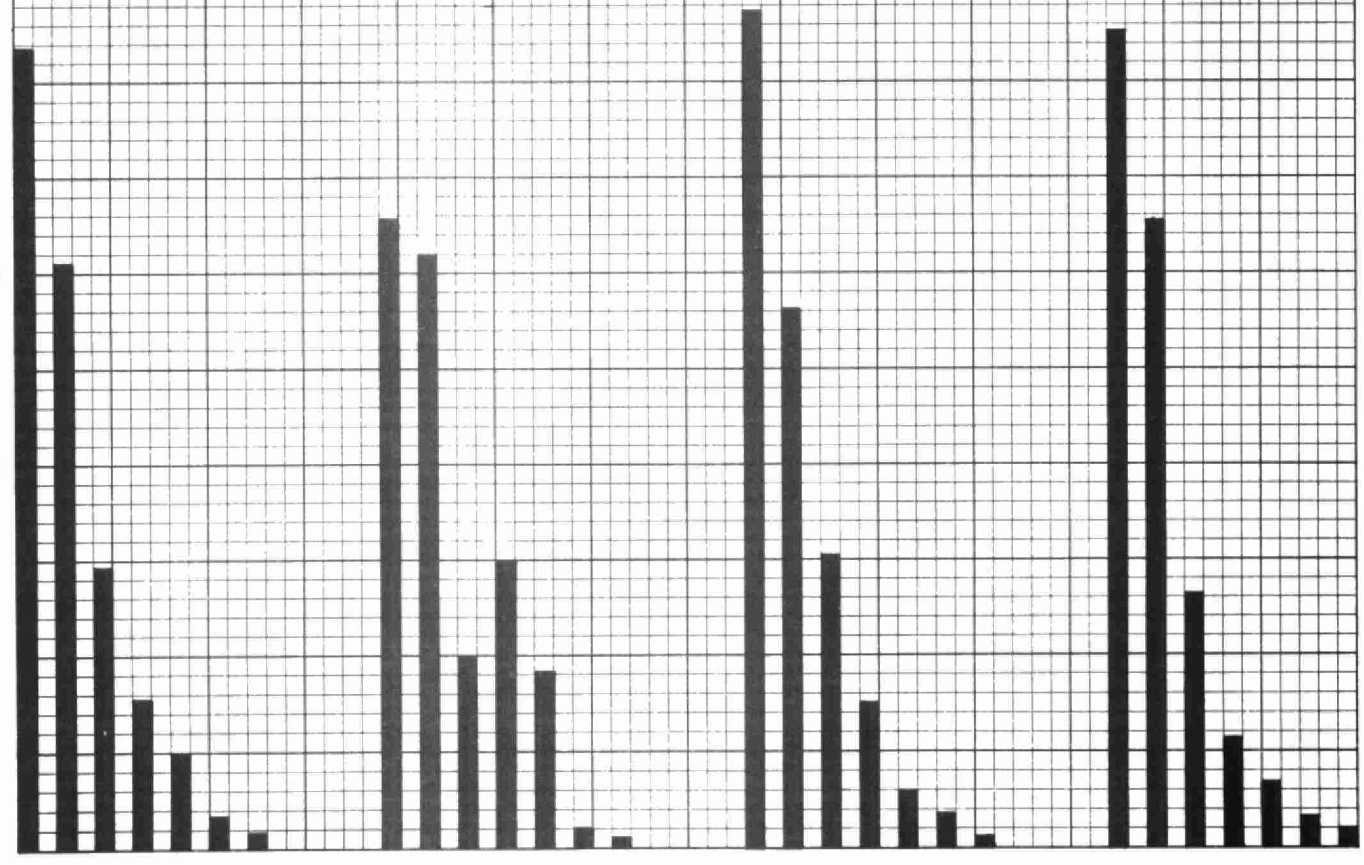


TABLE III
UNION WATER TREATMENT PLANT

AREA	CONSUMPTION OF AREAS					
	CONSUMPTION (MG)			% OF TOTAL		
	1960	1961	1962	1960	1961	1962
Gosfield South	16.34	37.29	51.74	1.6	2.0	3.9
Gosfield North	9.95	13.13	21.60	0.9	1.1	1.6
Mersea	55.70	79.85	99.51	5.3	6.5	7.4
Leamington	335.00	399.91	404.04	31.8	32.5	30.4
Heinz	500.00	534.50	557.04	47.5	43.5	41.8
Essex	130.00	158.58	190.04	12.4	12.9	14.3
Maidstone	5.41	6.37	8.45	0.5	0.5	0.6
TOTAL:	1052.40	1229.63	1332.42	100.0	100.0	100.0

TURBIDITY

Graph III indicates the variation in raw water turbidity in 1962. From the graph it is seen that the average raw water turbidity is only 10 parts per million. Thirty per cent of the time the turbidity exceeds 15 ppm and 10 per cent of the time the turbidity exceeds 27 ppm.

Raw water turbidities are usually high during the months of January, March, April, November and December when the lake is undergoing its spring and fall turnover. It is fortunate that the periods of high turbidity do not occur during the peak flow demand months of May till September. A combination of high turbidity and high flow would unduly overload the rapid sand filters.

Table IV indicates the maximum, minimum and average turbidities for the clarified and filtered water at the plant.

Graph IV shows the seasonal variation of the raw, clarified and filtered water. It is seen that during the spring turnover when the water is extremely cold, the clarifier is at its lowest efficiency. The filtered water has a low turbidity all during the year and rises only slightly in February.

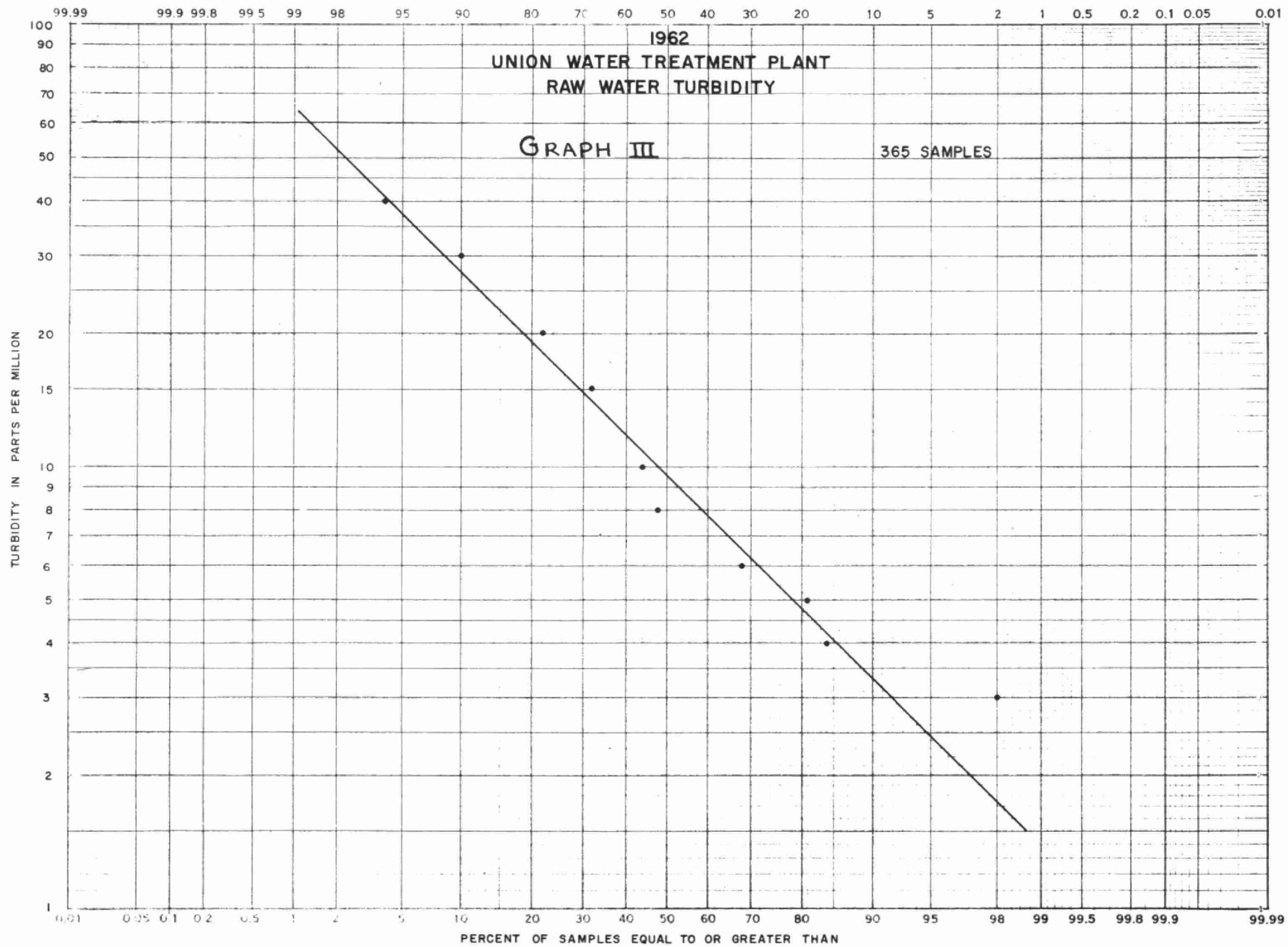
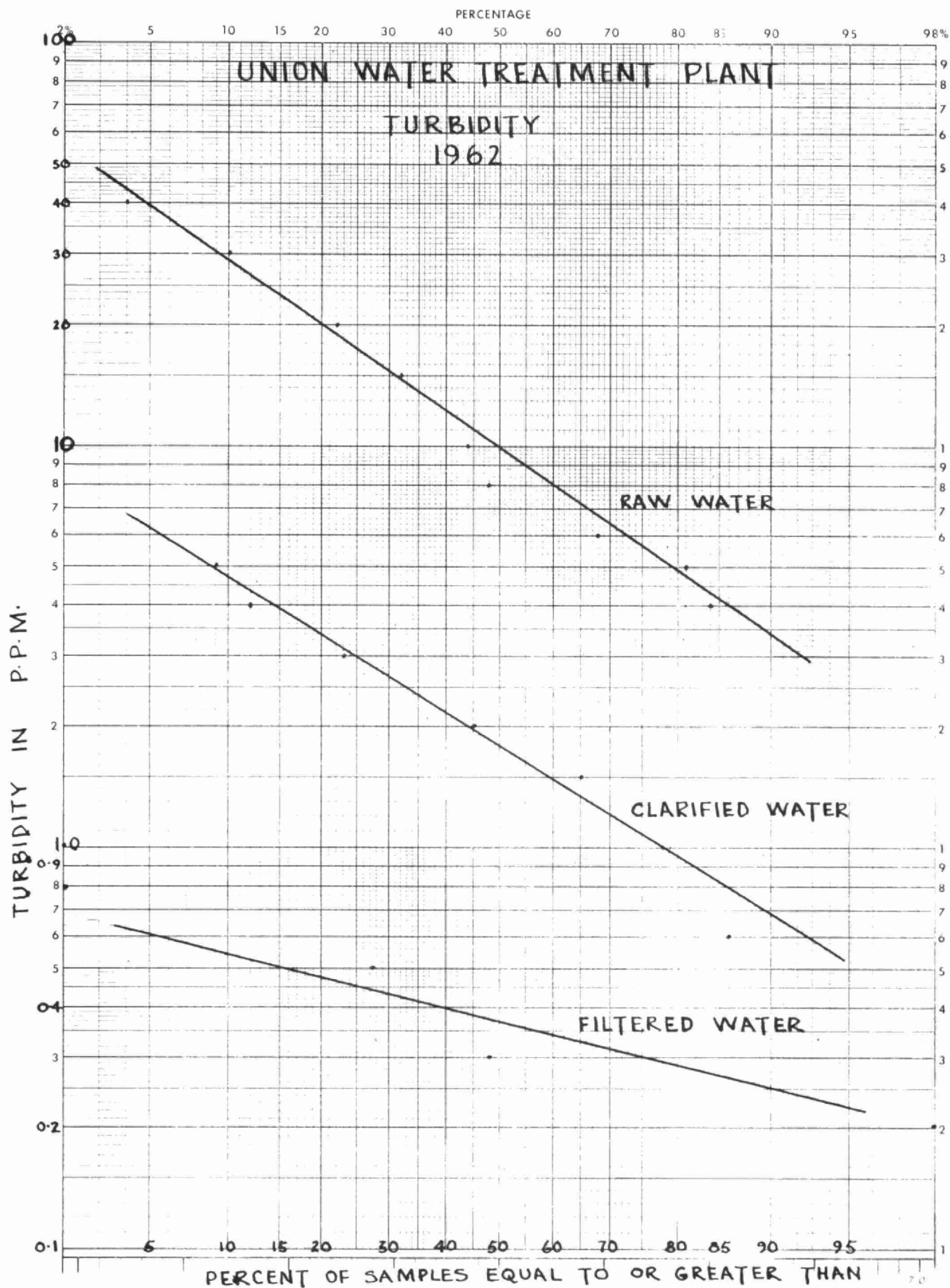


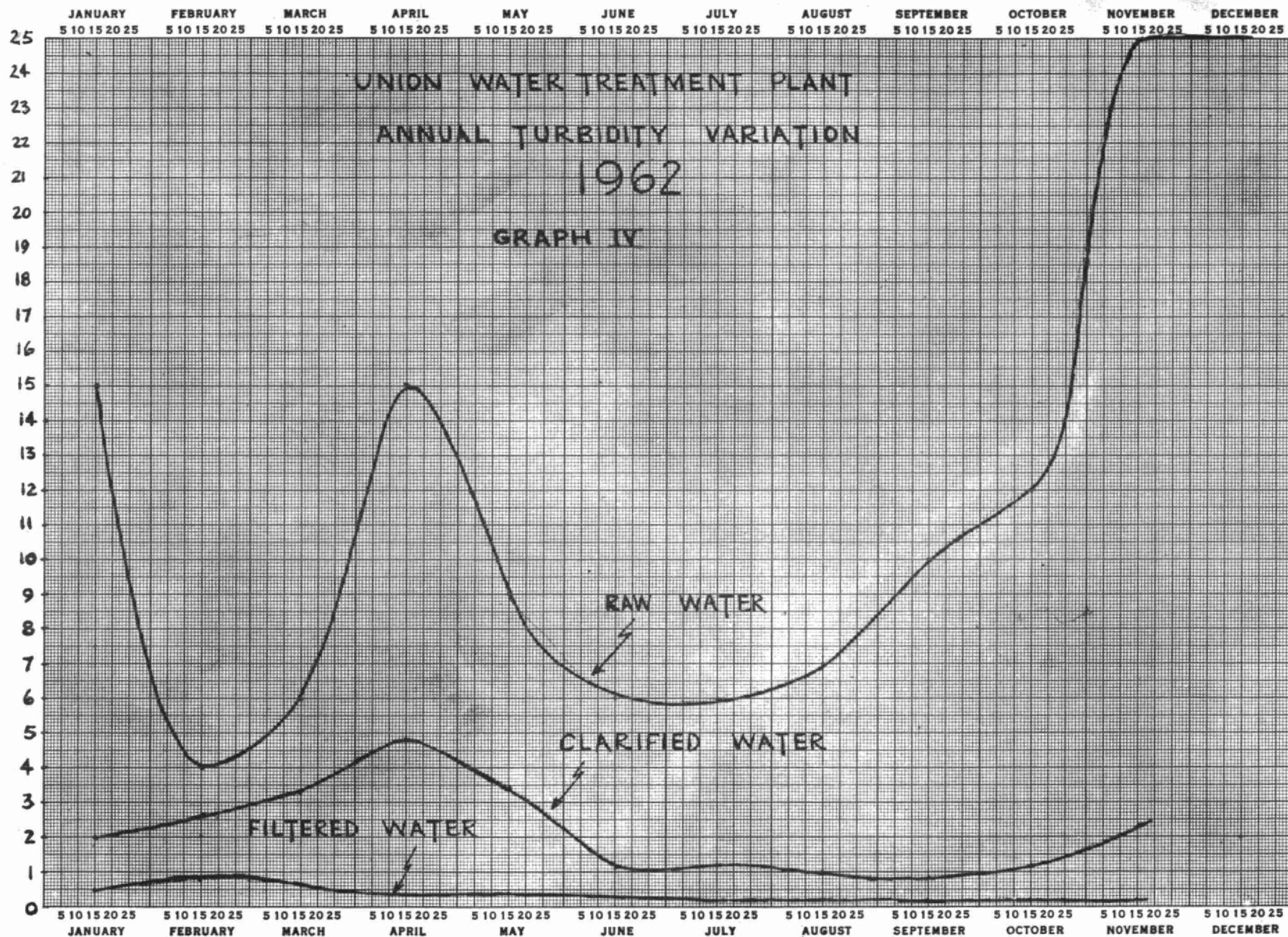
TABLE IV
UNION WATER TREATMENT PLANT

MONTH	TURBIDITIES AT PLANT in ppm turbidity units					
	<u>CLARIFIED</u>			<u>FILTERED</u>		
	Max.	Min.	Avg.	Max.	Min.	Avg.
January	7.0	0.5	2.0	0.5	0.4	0.5
February	18.0	0.6	2.6	1.0	0.3	0.8
March	7.7	1.5	3.3	3.0	0.2	0.6
April	10.0	2.0	4.8	0.5	0.4	0.4
May	9.5	1.5	3.4	0.5	0.4	0.4
June	2.0	0.2	1.1	0.4	0.2	0.3
July	2.0	0.5	1.2	0.3	0.2	0.2
August	2.0	0.2	1.0	0.2	0.2	0.2
September	1.8	0.5	.8	0.2	0.2	0.2
October	2.5	0.4	1.2	0.8	0.2	0.2
November	3.5	1.5	2.3	0.2	0.2	0.2
December	4.0	1.0	2.0	0.2	0.2	0.2
AVERAGE:	5.8	.9	2.1	.65	.26	.35

GB-22
PROBABILITY SCALE X 3 CYCLE LOG.
MADE IN CANADA



TURBIDITY IN P.P.M.



ALGAE

Raw water at the plant must be treated to remove the algae which grow in Lake Erie. During 1962 a program of algae counting was started. Algae counting is a difficult and time-consuming task and the number of counts were kept to a minimum.

The following table indicates the dates on which counts were made and the number of algae per cubic centimeter noted.

<u>DATE</u>	<u>COUNT</u>
May 1	115
May 2	130
May 14	140
May 22	110
May 29	106
June 14	80
July 12	130
July 17	300
July 20	240
July 30	318
July 31	420
August 3	634
August 14	380

The interpretation of algae counts and identification is a difficult task and no attempt is made to analyse the above results as they relate to the operation of the plant.

On September 5th, 1962 a biologist from the OWRC laboratory did an algae analysis at the plant. The following table indicates the percentage reduction in numbers of algae following micro-straining and clarification.

	Raw Water Total Count <u>Per Milliliter</u>	<u>Percentage</u> After Micro - <u>strainer</u>	<u>Reduction</u> After Clari- <u>fier</u>
Blue Green Algae	1041	57%	95%
Green Algae	165	67%	94.5%
Diatoms	1570	72%	89%
TOTAL:	2776	66% mean	91% mean

The microstrainer removes most of the larger species of algae. The clarifier removes some additional algae but the remaining algae must be removed by the rapid sand filters.

CHLORINATION

Table V indicates the average dosages, average residuals and total pounds of chlorine used for pre and post chlorination. A total of 35,906 pounds of chlorine were used.

The price of chlorine delivered to the Union plant is \$ 585.00 per 3 one ton cylinders which is a price of 9.75 cents per pound. Therefore, using 35,906 pounds at 9.75 cents per pound amounts to \$ 3500.00. This calculated cost is within \$10.00 of the total chlorine invoices paid in 1962. It is seen that the plant staff have maintained rigid control on their chlorine and chlorine cylinder inventory.

TABLE V
CHLORINATION

MONTH	PRECHLORINATION			POSTCHLORINATION		
	AVERAGE DAILY DOSAGE.LBS/ 1000 gal. flow	AVERAGE DAILY RESIDUAL ppm	TOTAL POUNDS USED	AVG.DAILY DOSAGE.LBS/ 1000 gal.flow	AVG.DAILY RESIDUAL ppm	TOTAL POUNDS USED
Jan.	17	0.15	952	5.0	0.4	322
Feb.	11	0.15	874	5.0	0.4	292
Mar.	17	0.15	1094	5.0	0.4	365
Apr.	22	0.15	1271	5.0	0.4	431
May	21	0.15	2626	10.0	0.4	877
June	40	0.15	3503	10.0	0.4	1165
July	45	0.15	3707	9.0	0.4	1231
Aug.	55	0.15	5093	5.0	0.4	1584
Sept.	42	0.15	3619	7.0	0.4	1199
Oct.	26	0.15	2100	6.0	0.4	694
Nov.	23	0.25	1183	4.0	0.4	390
Dec.	20	0.15	994	4.0	0.4	340
TOTAL			27016			8890
AVERAGE:	28	0.16	2250	6.3	0.4	740

Total chlorine used = 35,906 pounds

MAINTENANCE

On February 19 - 21 technicians from the OWRC head office made their annual inspection of the Union plant. This inspection covers buildings, mechanical equipment and electrical equipment. Written reports on the inspection are submitted to the project engineer for appropriate action. In general, the Union plant was in excellent condition although the low lift pumps will be examined in 1963.

On April 15 - 17, the anodes for cathodic protection were installed in the Essex and Leamington elevated tanks. Assistance was also given in calibrating the Leamington elevated water level recorder.

On October 31 - November 1, the anodes on both tanks were removed to protect them from the winter weather conditions.

ESSEX ELEVATED TANK

On October 23, 1962 an inspection was made of the Essex elevated tank by Horton Steel Works, Limited. The following recommendations were made :-

1. In the spring all bare, abraded areas and areas showing loose scale or tubercles should be cleaned by sandblasting of all rust, loose scale paint and foreign deposits and given one coat of red lead epoxy primer.
2. Two weeks after installation of the anodes in the spring, the solution potential should be checked. In general, the tank showed only minor deterioration.

LEAMINGTON ELEVATED TANK

On October 22, 1962 an inspection was made of the Leamington elevated tank by Horton Steel Works, Limited.

The following recommendations were made :

1. In the spring all bare and abraded areas should be cleaned by sandblasting of all rust and loose paint and given one coat of red lead epoxy paint.
2. The anodes should be reinstalled and checked with a meter to ensure proper current distribution.
3. The rectifier should be overhauled.
4. Patch painting should be done to the field joints in the roof and to the marks on the outside of the roof and shell.
5. Consideration should be given to the installation of additional anodes to give better protection to the curved portions of the bottom plates.
6. The bottom 8 feet of the riser should be blast cleaned and receive 3 coats of paint.

Arrangements have been made to drain the Leamington tank in the spring and hose out the mud which has accumulated on the bottom of the tank. This mud accumulated when water was being pumped untreated before the plant went into operation.

When the tank is lowered the necessary repairs will be carried out.

PLANT SEWER

In November a trickle of water was noticed coming out between the centre joint of the concrete roadway leading from the low lift station. Both the watermain from the low lift and the waste water sewer coming from the plant were suspected.

After a series of tests, the trouble was isolated in a portion of the waste water sewer at the top of the ramp. As soon as the weather permits, it will be necessary to repair the break before any more damage is done by the water trickling from the sewer. It is suspected that the pipe has slipped downhill slightly and caused one of the pipe joints to separate.

LOCAL ADVISORY COMMITTEE

The Local Advisory Committee for the plant has functioned effectively during 1962. Regular meetings were on the following dates :-

1. January 23rd
2. May 1st
3. August 2nd
4. October 24th

A special meeting was held on June 21st to discuss water contract minimums and possible changes in the formula used to apportion costs.

A special meeting was held on November 12th to decide on the 5 year guaranteed minimum consumptions.

CHEMICAL COSTS

Three major chemicals are used in the treatment of the water at the Union plant.

Chlorine is used to maintain a chlorine residual in the water to ensure the absence of pathogenic bacteria. Alum is used to form a floc in the clarifier which traps and removes most of the turbidity. Activated carbon is used for the removal of taste and odour in the raw water.

The total yearly costs for each of the chemicals is as follows :-

Chlorine	-----	3510.00
Alum	-----	4849.02
Activated Carbon	----	567.50
TOTAL:	-----	8926.52

Minor amounts of chemicals are also required for laboratory testing.

OPERATING COSTS

Table VI outlines the 1962 operating costs under the various headings. The total cost of the complete UNION WATER SYSTEM was \$ 101,473.00 which is a cost of 7.7 cents for each 1000 gallons produced. This is a slight increase over 1961 when the cost was 7.4 cents per 1000 gallons.

POWER

Power bills allocated against the appropriate source are listed below :

<u>MONTH</u>	<u>TREATMENT PLANT</u>	<u>LOW LIFT PUMPHOUSE</u>	<u>COTTAM BOOSTER STATION</u>	<u>LEAMINGTON ELEVATED TANK</u>
Jan.	1548.99	188.32	101.23	
Feb.	1630.96	189.63		33.45
Mar.	1581.07	184.28	60.87	
Apr.	1545.43	185.47		
May	1905.89	182.50	194.39	78.26
June	2329.52	175.73		
July	2157.08	175.85	76.40	
Aug.	1925.05	174.07		28.42
Sept.	2005.52	172.88	76.40	
Oct.	2005.31	175.01		
Nov.	1704.43	178.46	91.92	21.28
Dec.	1640.28	184.05		
TOTAL:	21979.53	2166.25	601.21	161.41
TOTAL POWER COSTS = \$ 24,908.40				

COMPLETE UNION WATER SYSTEM

TABLE VI

MONTH	EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JANUARY	5107.31	2957.38	-----	22.25	1838.54	-----	84.34	-----	-----	204.80
FEBRUARY	7776.02	2966.84	-----	571.08	1854.04	736.07	265.37	154.25	78.72	1149.65
MARCH	10171.17	2965.16	-----	599.76	1826.22	2595.61	213.42	-----	1737.29	233.71
APRIL	4967.53	2965.16	7.50	522.57	1730.90	(900.00)	16.60	54.86	-----	569.94
MAY	5479.59	2965.16	-----	347.31	78.26	655.76	371.22	-----	56.72	1005.16
JUNE	11387.72	2970.09	-----	220.06	4788.03	1214.89	665.18	964.60	185.13	379.74
JULY	13178.69	2962.26	-----	51.51	2409.33	600.62	93.96	189.00	167.28	6704.73
AUGUST	8704.99	4454.71	-----	36.27	202.49	1570.50	329.95	967.07	294.95	849.62
SEPTEMBER	11238.74	2963.20	-----	15.23	4179.85	2070.77	814.16	232.78	283.36	679.39
OCTOBER	5752.18	2963.20	-----	21.14	175.01	1189.43	647.74	414.85	-----	340.81
NOVEMBER	8754.79	2963.20	-----	151.86	4001.40	(60.00)	198.81	572.00	575.22	352.30
DECEMBER	8954.25	4874.76	-----	548.98	1824.33	(450).00	681.39	-----	960.06	514.73
TOTAL:	101472.98	38971.12	7.50	3108.02	24908.40	9223.65	4382.14	3549.41	4338.73	12984.58

NOTE: THE COSTS LISTED ABOVE ARE TO BE USED IN CALCULATING THE OPERATING COSTS
FOR THE COMPLETE UNION WATER SYSTEM. THEY INCLUDE THE ESSEX COMMON,
ESSEX EAST AND ESSEX WEST COSTS WHICH FOR BILLING PURPOSES ARE LISTED SEPARATELY.

SUNDRY

Various costs in the operation of the plant are listed under the sundry column. The major sundry items can be broken down as follows :-

TELEPHONE CHARGES

The telephone charges are made of rental of the telemetering lines from the elevated tanks, the low lift station and the booster pumping station as well as charges for the telephone at the plant and the low lift station. In 1962, the telephone charges totalled \$1403.60.

TAXES

In 1962, taxes were paid as follows :

In May \$688.39 was paid to the Township of Mersea for taxes on the Leamington elevated tank. This expenditure was for 1961 taxes.

In July, \$6,333.25 was paid to the Township of Gosfield South for taxes on the treatment plant and low lift pumping station. The 1962 taxes on the Leamington elevated tank amounting to \$720.01 was also paid to the Township of Mersea.

In September, \$238.33 was paid to Gosfield North for taxes on the Cottam booster station.

EQUIPMENT

In 1962, office furnishings for the plant board-room were purchased for \$1931.67.

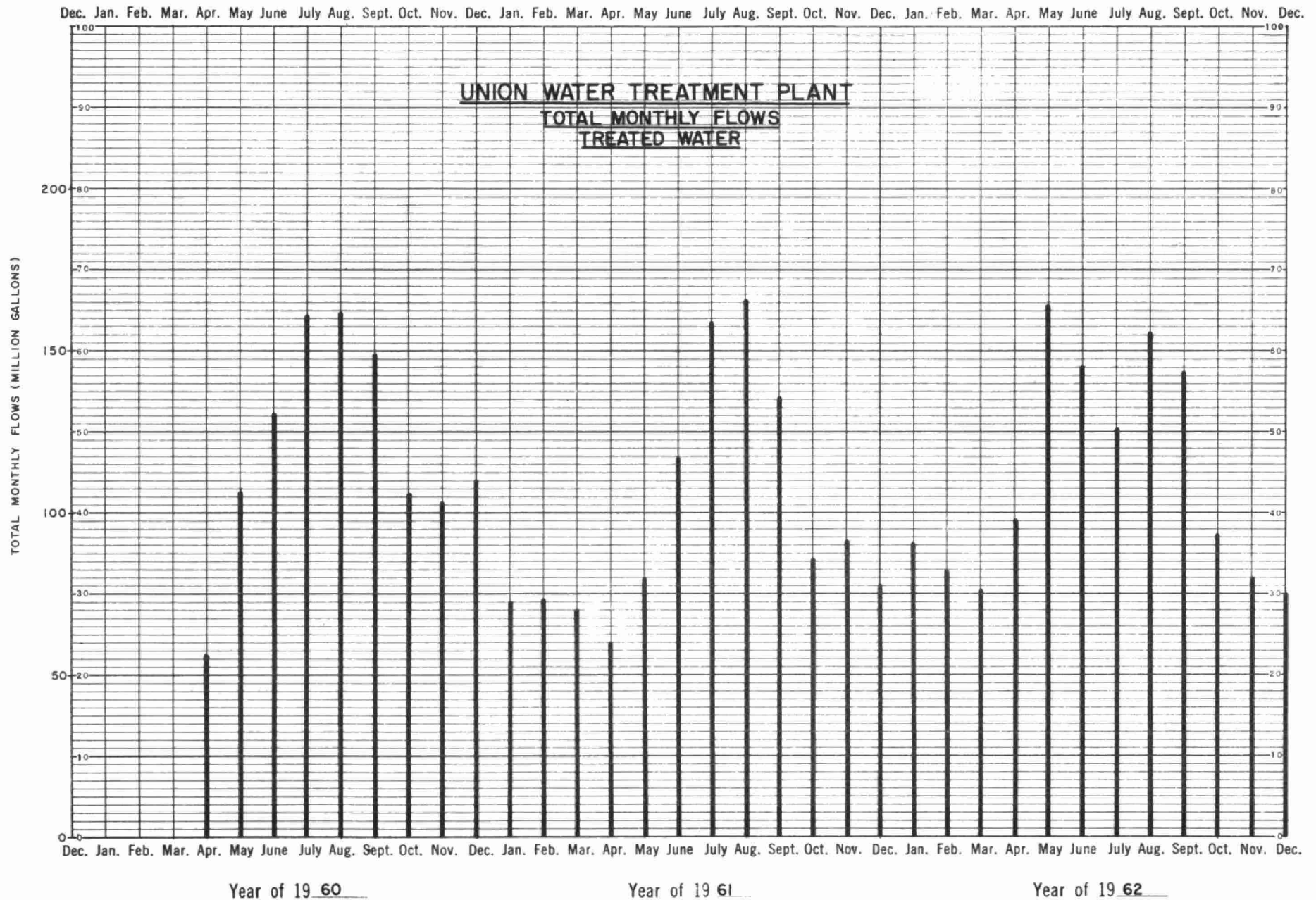
HONEYWELL SERVICE

The total charges for servicing of the plant control panel and the supply of the necessary replacement parts amounted to \$3,478.22 in 1962.



GC 8-66

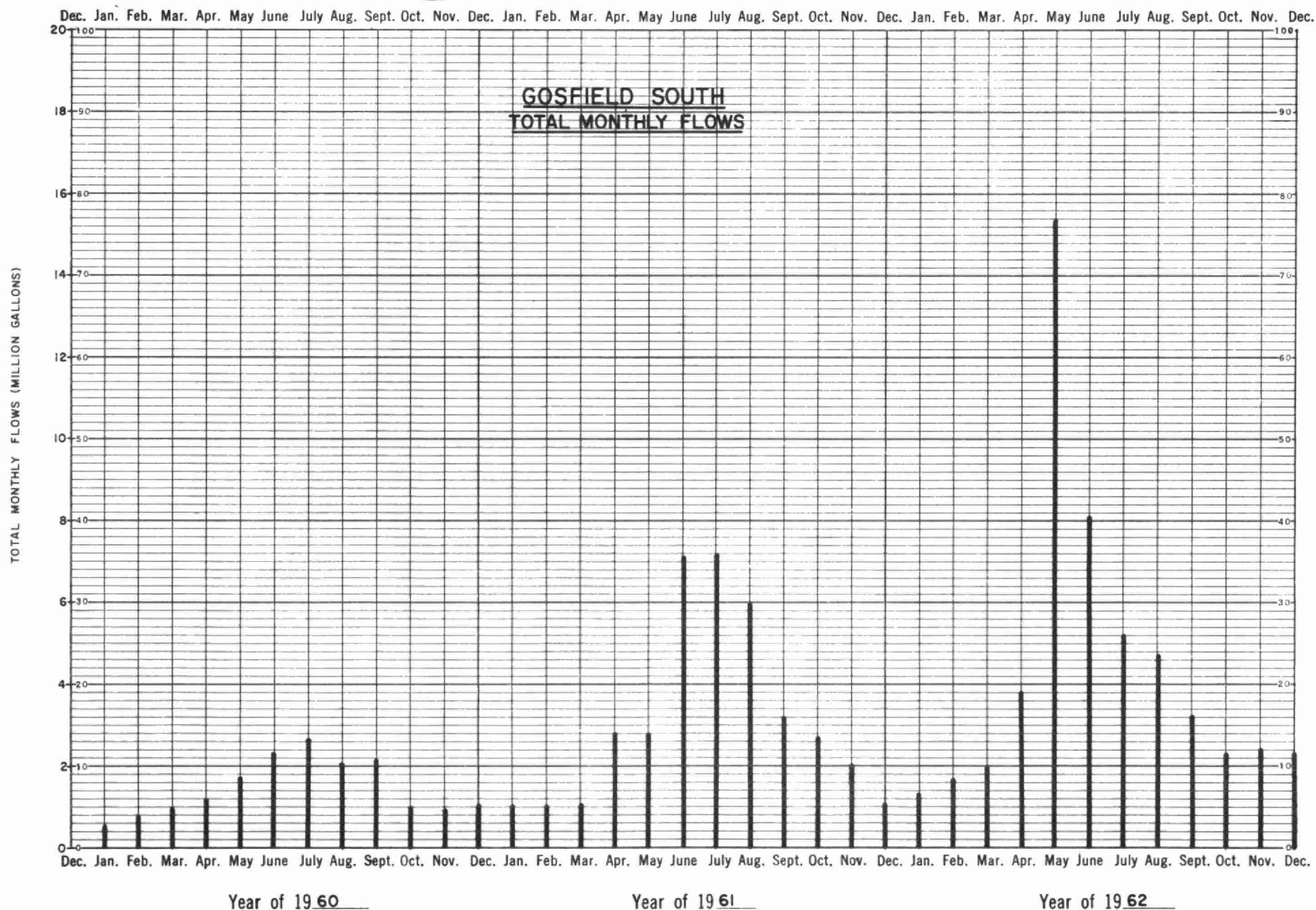
Three Years by Months X 100 Divisions
MADE IN CANADA





GC 8-66

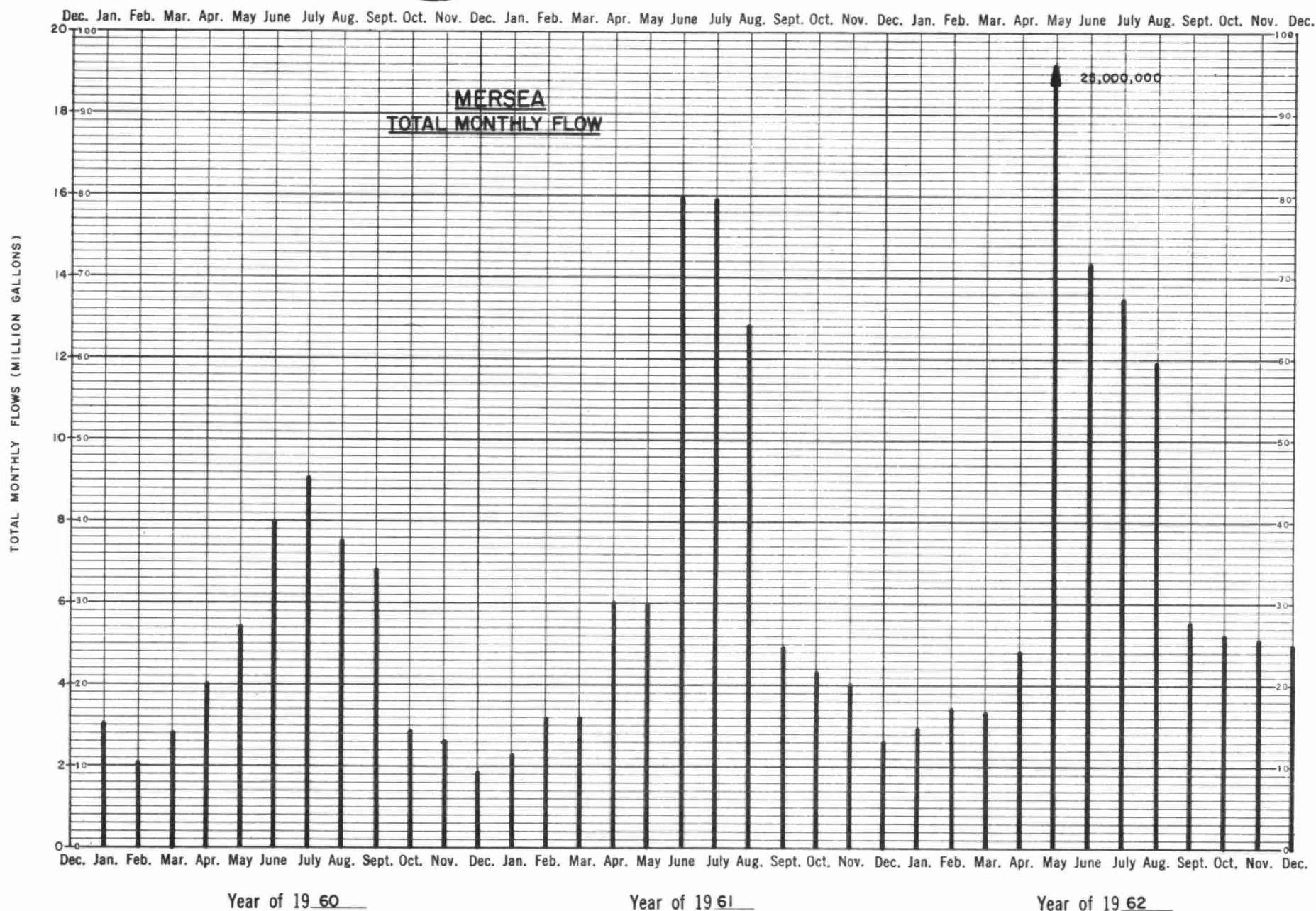
Three Years by Months x 100 Divisions
MADE IN CANADA





GC 8-66

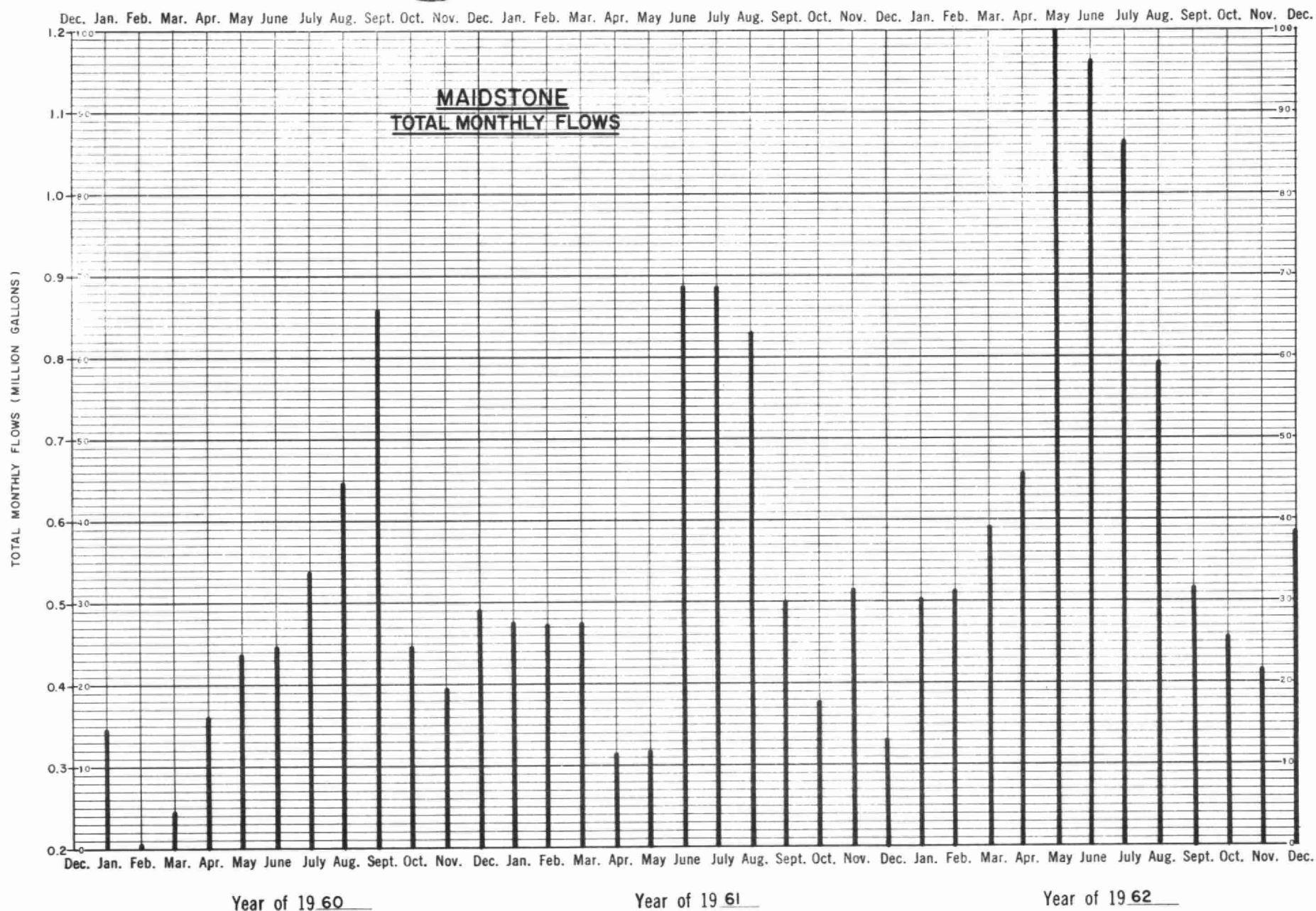
Three Years by Months X 100 Divisions
MADE IN CANADA





GC 8-66

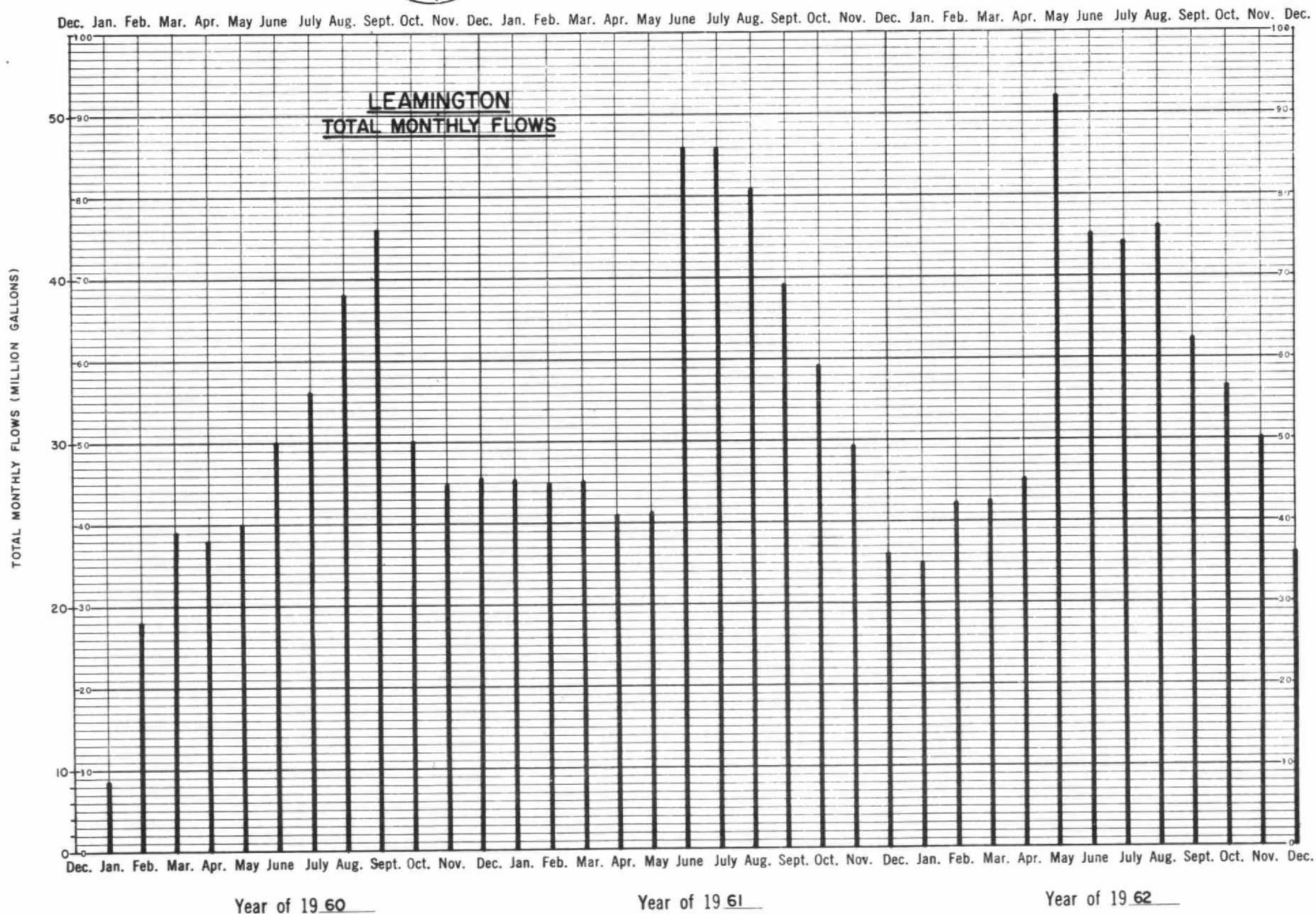
Three Years by Months X 100 Divisions
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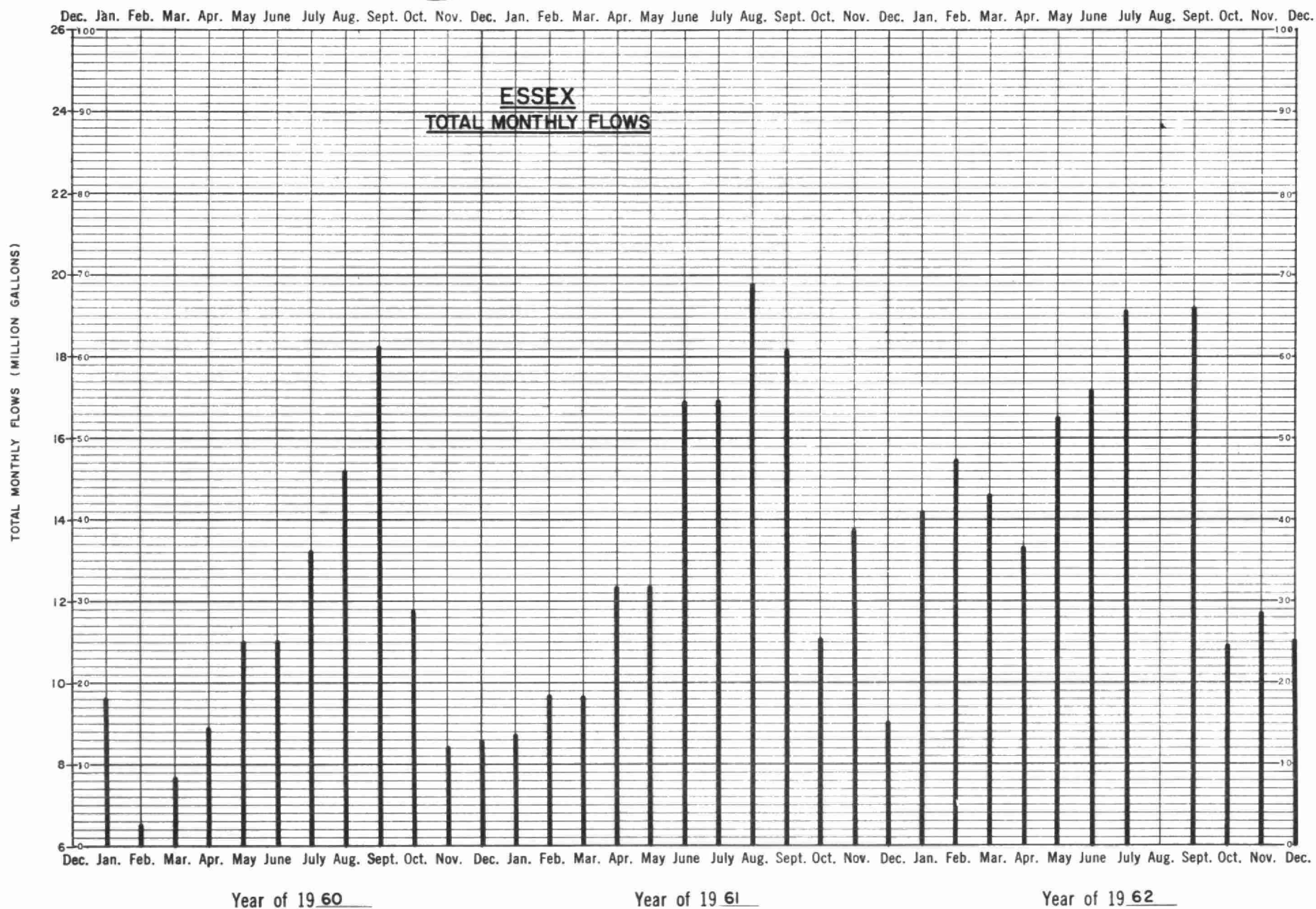
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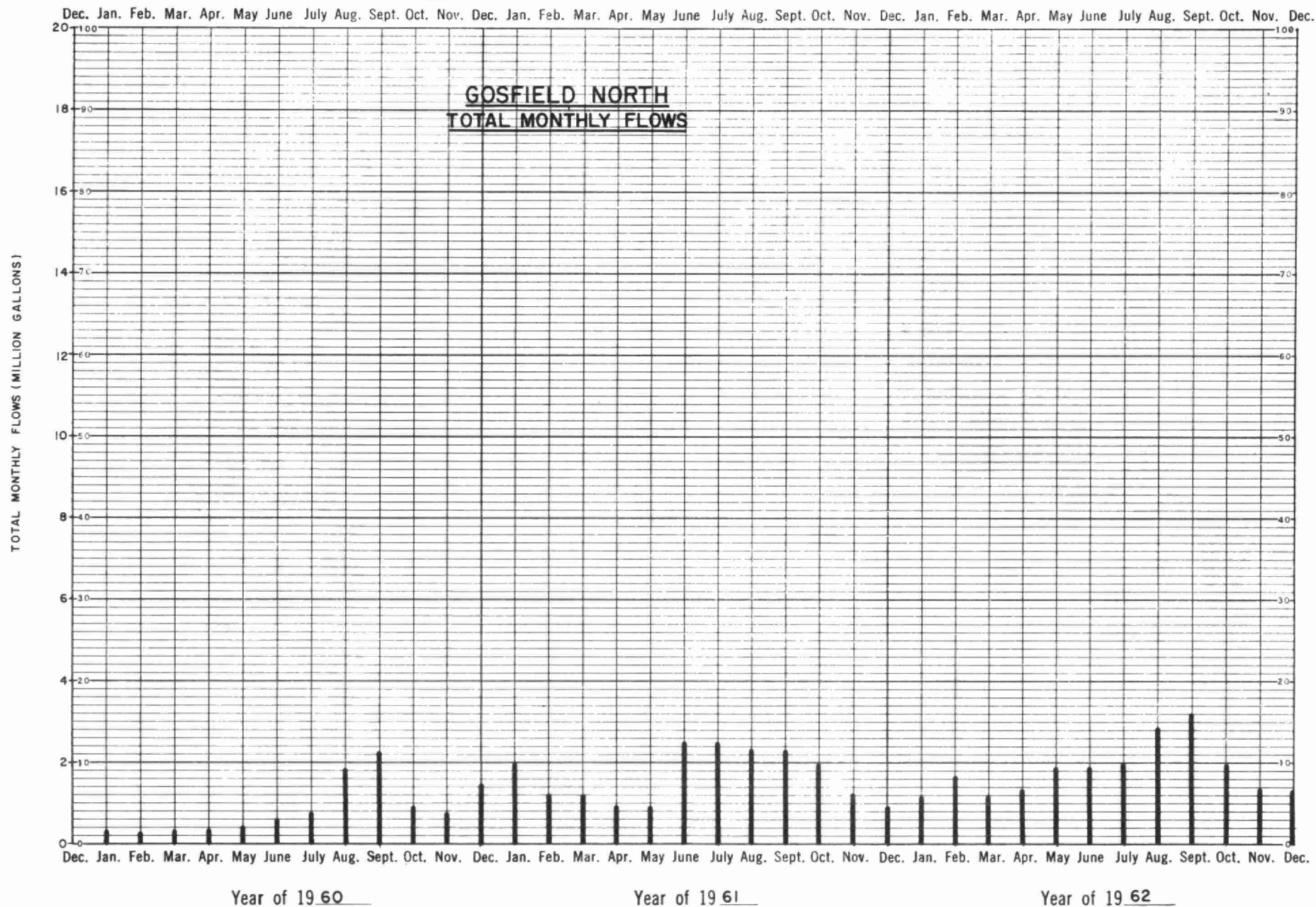
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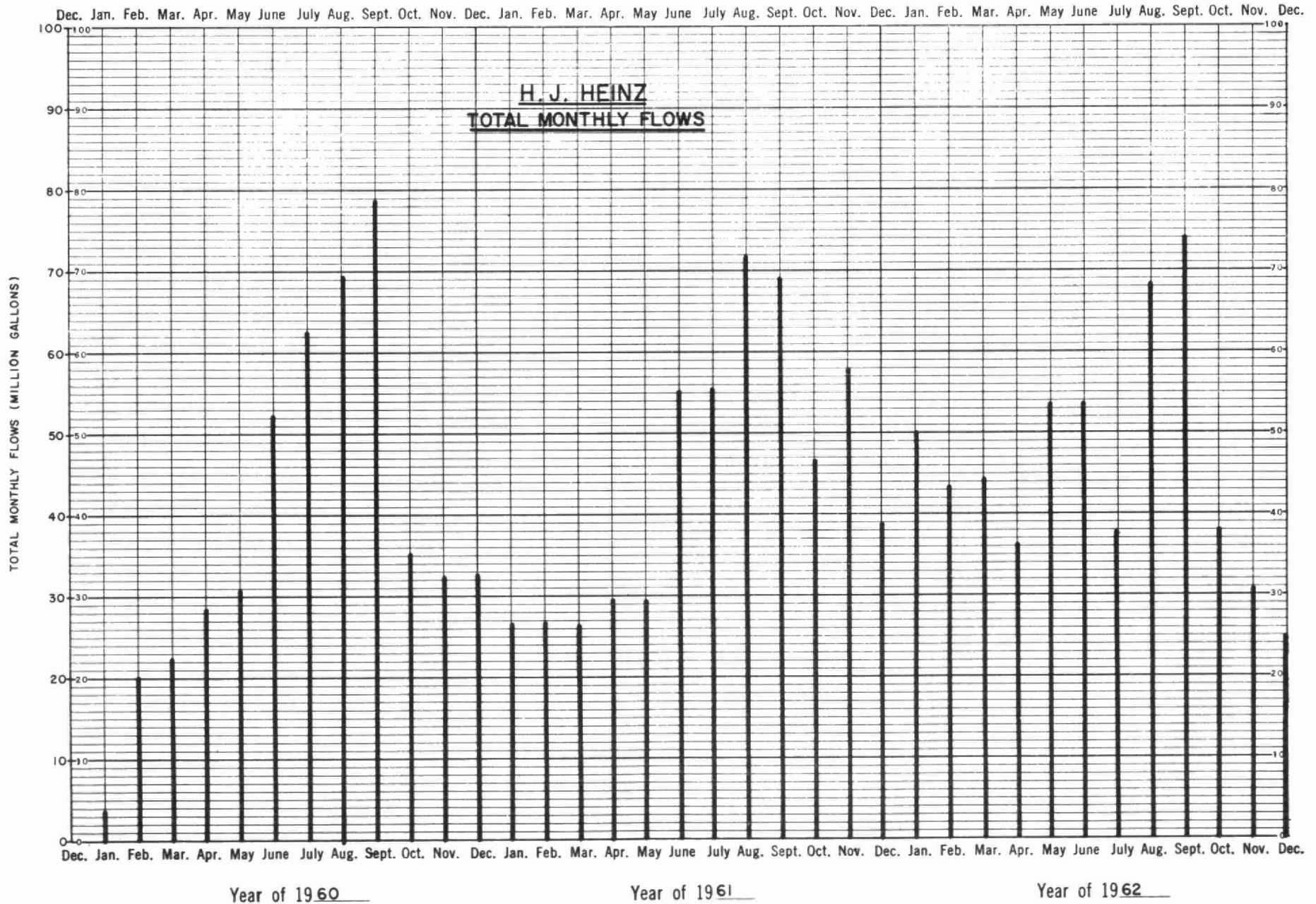
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